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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/522,707	03/10/2000	Kazumasa Hiramatsu	2185-0408P-SP	5987

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EXAMINER	
BAUMEISTER, BRADLEY W	
ART UNIT	**PAPER NUMBER**
2815	

DATE MAILED: 11/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/522,707	Hiramatsu et al.
Examiner	**Art Unit**
B. William Baumeister	2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Aug 25, 2003* .

2a) ☐ This action is **FINAL.** 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) *1 and 10* is/are allowed.

6) ☒ Claim(s) *2, 8, and 9* is/are rejected.

7) ☒ Claim(s) *3-7* is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restriction

1. Claim 1 is allowable due to the limitation relating to the FWHM. As this limitation is also in method claim 10, claim 1 is a linking claim. Accordingly, the restriction between the product claims of invention I and method claim 10 of invention II is hereby withdrawn. Claim 10 is therefore rejoined and allowed.

In view of the above noted withdrawal of the restriction requirement as to the linked inventions, applicant(s) are advised that if any claim(s) depending from or including all the limitations of the allowable generic linking claim(s) be presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 2 and claims 8 and 9 as they depend from claim 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakamura et al., "Long lifetime violet InGaN/GaNAlGaN-based semiconductor lasers," 5/28/1998, pp. 52-58 [hereinafter, "Nakamura, 'Long lifetime lasers'"].

a. Nakamura, "Long lifetime lasers" discloses GaN-based light emitters formed on sapphire by means of an MOCVD-grown (or "vapor phase epitaxy method;" page 53, paragraph 2) GaN epitaxial lateral overgrowth (ELOG) buffer that includes an SiO2 pattern (e.g., FIG.2) The second, overgrown GaN buffer layer includes voids above the SiO2 pattern (e.g., FIG 1): i.e., "an upper surface of the pattern is not in contact with said second III-V compound semiconductor," as set forth in claim 2.

b. The examiner is currently interpreting claim 2 to require that at least only a portion of the upper pattern surface is not contacted by the second III-V material (as is the case in FIG. 1 of Nakamura). If Applicant should subsequently argue that the language of claim 2 requires none of the upper surface of the pattern be contacted with the III-V material, this may potentially raise 112-paragraph, enablement, written description and/or indefiniteness issues, since applicant's specification states that "the present invention is characterized in that overgrowth of the regrown

layer is **almost** not observed on the pattern." (Specification, page 7, second full paragraph; emphasis added.)

Allowable Subject Matter

4. Claims 1 and 10 are allowed.

5. Claim 3-9 are objected to as being dependent upon a rejected base claim (independent claim 2), but claims 3-9 would be allowable if rewritten so as to be dependent only from independent claim 1. Claims 3-7 would allowable if rewritten in independent form including all of the limitations of the base claim 2 and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

The examiner is persuaded by Applicant's arguments that various factors relating to the particular growth method employed (e.g., VPE vs LPE) used and the particular method's parameters (particular temperature and pressure) preclude reliance upon the inherency doctrine for either the limitation relating to the FWHM characteristic of claims 1 or the limitation relating to the presence of the space above the pattern, as set forth in claim 2. Restated:

a. Nakamura, "Long lifetime lasers" evidences that it was well known to employ VPE, ELOG growth of GaN-based materials with SiO2 patterns, and specifically teaches that depending upon the particular manufacturing conditions, that voids are sometimes formed over the pattern. Further, Mauk teaches that it was known to alternatively employ refractive metals

such W or WN or other multilayer-films for the ELOG pattern material for the purpose of increasing reflection in addition to improving growth. Mauk also teaches that such patterns may be employed in GaN-based systems, and that the specific materials employed for the pattern depend upon the particular first and second semiconductor layers of the ELOG buffer. Nakamura, "Long lifetime lasers" and other references cited hereinbelow further teach that VPE methods--as opposed to LPE methods--were conventionally employed when specifically growing GaN-based ELOG buffer layers as opposed to GaAs-based ELOG buffers.

b. As such, incorporating rationales set forth in previous Office Actions for the dependent claims, it would have been obvious to one of ordinary skill in the art at the time of the invention to have provided GaN-based emitters on sapphire substrates through various VPE ELOG processes, and it would have been obvious to have employed a pattern composed of W, WN, some other refractory metal, or of a multilayer structure as taught by Mauk for the purpose of enabling the ELOG pattern to simultaneously function as a reflector, thereby increasing the light emission from the light emitter. Also, as Mauk teaches that the particular materials constituting the pattern must be chosen for compatibility with the underlying first semiconductor layer, if actual attempts at employing W patterns in GaN systems as specifically taught by Mauk proved to cause material incompatibility problems with the underlying GaN layer, it would have been obvious for the skilled artisan to have developed a W-over-SiO2 multilayer through routine experimentation since the W would have provided the desired reflectivity and the SiO2 was known to be a common pattern material for GaN.

c. Also, various references cited herein teach that it was known to provide GaN layers on sapphire such that their defect density is as low as about 1e4 cm^-2 (e.g., Davis, col. 4), and that it was known to provide GaN layers having a FWHM of about 0.0976 degrees (or about 5.86 arc-sec) (see e.g., Wong et al.), and specifically, a FWHM (0004) GaN reflection of 270 arc-sec (Redwing '747, cols. 5, 18 and 26).

d. But none of the references made of record expressly state whether a device made according to the method parameters of the respective references would inherently or necessarily result in the upper III-V layer producing a FWHM of the (0004) reflection X-ray rocking curve of 700 seconds or less regardless of the direction of X-ray incidence, as set forth in claim 1. Further, while including the structural limitations of claims 3-7 would have been otherwise obvious, none of these references expressly disclose that such devices--including the further limitations of any of claims 3-7--would inherently or necessarily produce a void at the pattern surface.

e. As such, while it may well be the case that at least some GaN-based ELOG devices--when formed through obvious modification or routine experimentation/optimization so as to possess the other, structural limitations that are set forth in any of the claims--would *in fact* also satisfy the FWHM limitation of claim 1 or would *in fact* possess voids as set forth in claim 2, the references of record are not sufficient for the examiner to meet his burden of showing that such obvious or routine modifications to the growth process parameters or materials selected would produce an ELOG buffer that would inherently satisfy either of these criteria.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Redwing '747

b. Davis '849

c. Linthicum '688

d. Marx '485

e. Beaumont '850

f. Kiyoku '010

g. Yu, et al., "Study of the epitaxial-lateral-overgrowth (ELO0 process for GaN on sapphire," Journal of Crystal Growth 195 (1998) 333-339.

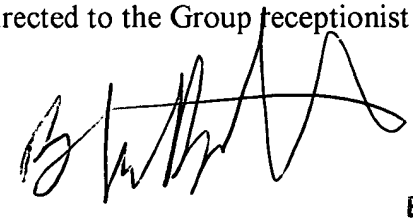
h. Sakai et al., "Defect structure in selectively grown GaN films with low threading dislocation density," Appl. Phys. Lett. 71 (1`6) 20 October 1997, pp. 2259-2261.

i. Wong et al., "Damage-free separation of GaN thin films from sapphire substrates," Appl. Phys. Lett. 72 (5), 2 February 1998, pp. 599-601.

j. Jones et al., "Characteristics of GaN Stripes Grown by Selective-Area Metalorganic Chemical Vapor Deposition," Journal of Electronic Materials, Vol. 26, No. 3, 1997, pp. 306-310.

INFORMATION ON HOW TO CONTACT THE USPTO

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, **B. William Baumeister,** at **(703) 306-9165.** The examiner can normally be reached Monday through Friday, 8:30 a.m. to 5:00 p.m. If the Examiner is not available, the Examiner's supervisor, Mr. Tom Thomas, can be reached at (703) 308-2772. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



BRADLEY BAUMEISTER
PRIMARY EXAMINER

B. William Baumeister

Primary Examiner, Art Unit 2815

November 14, 2003